

IN THE CLAIMS:

Please cancel Claims 1 to 3, 7, 10 to 12, 19, 25, 27 and 28 without prejudice or disclaimer of subject matter. Please amend Claims 4, 5, 8, 9, 13, 14, 17, 18, 21 to 24 and 26 as shown below. The claims, as pending in the subject application, read as follows:

1. to 3. (Cancelled)

4. (Currently Amended) An image indexing A method of indexing a digital image according to Claim 3 comprising a plurality of blocks, comprising the following steps:

generating a first information item characteristic of the visual content of the image;

generating a second information item from the first information item,
wherein the second information item is indicative of a degree of significance of the visual content of at least one of the plurality of blocks with respect to the overall content of the image and thereby characteristic of the spatial distribution of the visual content of the image in its image plane; and

associating, with the image, an index composed of the first information item and the second information item,

wherein said step of generating the first information item comprises the following substeps:

dividing the image plane of the image according to a partitioning comprising the plurality of blocks, the plurality of blocks comprising a predefined number N of blocks;

extracting, from each of the blocks, a data item of a first type representing at least one characteristic of the visual content of the block under consideration; and generating the first information item as being a vector having N components, each of which is one of the data items of the first type,
wherein said step of generating the second information item comprises the following substeps:

calculating, for each of the blocks, a data item of a second type indicative of a degree of significance of the visual content of the block under consideration with respect to the overall content of the image;
generating the second information item as being a vector having N components, each of which is one of the data items of the second type, and
wherein for each of the blocks, the data item of a second type, indicative of a degree of significance of the visual content of the block under consideration with respect to the overall content of the image, is obtained by applying the following formula:

$$w_i^{\text{Im}} = \frac{\|h_i^{\text{Im}}\|}{\sum_{i=1}^N \|h_i^{\text{Im}}\|}$$

according to which the data item of the second type (w_i^{Im}) is obtained by calculating the ratio between the Euclidean norm of the data item of the first type associated with the

block under consideration and the sum of the Euclidean norms of the data items of the first type associated with all the blocks of the image.

5. (Currently Amended) An image indexing method according to ~~any one of Claims 2 to Claim 4~~, wherein the image plane of the image is divided according to a rectangular grid.

6. (Previously Presented) An image indexing method according to Claim 5, wherein the predefined number N of blocks is equal to sixteen.

7. (Cancelled)

8. (Currently Amended) ~~An image indexing A method of indexing a digital image according to Claim 7 comprising a plurality of blocks, comprising the following steps:~~

generating a first information item characteristic of the visual content of the image;

generating a second information item from the first information item,
wherein the second information item is indicative of a degree of significance of the visual content of at least one of the plurality of blocks with respect to the overall content of the image and thereby characteristic of the spatial distribution of the visual content of the image in its image plane; and

associating, with the image, an index composed of the first information item and the second information item,

wherein said step of generating the first information item comprises the following substeps:

dividing the image plane of the image according to a partitioning comprising the plurality of blocks, the plurality of blocks comprising a predefined number N of blocks;

extracting, from each of the blocks, a data item of a first type representing at least one characteristic of the visual content of the block under consideration; and

generating the first information item as being a vector having N components, each of which is one of the data items of the first type,

wherein:

the image plane of the image is divided according to a quadtree decomposition process by means of which, at each phase of the decomposition, a block under consideration, referred to as the "parent block", is decomposed into four blocks, referred to as "child blocks", equal in size to a quarter the size of the parent block, and whose combination gives the parent block, the decomposition beginning with the overall image plane of the image and finishing when the predefined number N of blocks is reached;

at each phase of the decomposition, there is calculated, for each of the child blocks, a data item of a second type, indicative of a degree of significance of the visual content of the child block under consideration with respect to the overall visual content of the parent block;

the second information item is composed of the set of the data items of the second type stored according to a quadtree structure, each node of which is constituted by one of the data items of the second type; wherein:

at each phase of the quadtree decomposition of the image, there is extracted, from the parent block under consideration, a data item of the first type representing at least one characteristic of its visual content and, for each child block obtained by decomposition of the parent block, there is extracted a data item of the first type representing at least one characteristic of the visual content of the child block under consideration; and

the data item of the second type indicative of a degree of significance of the visual content of a child block under consideration with respect to the overall visual content of the corresponding parent block is obtained by applying the following formula:

$$w_i^p = \frac{\|h_f^p\|}{\|h_p\|}$$

according to which the data item of the second type calculated for a child block under consideration is obtained by calculating the ratio between the Euclidean norm of the data item of the first type extracted for the said child block under consideration and the Euclidean norm of the data item of the first type extracted from the corresponding parent block.

9. (Currently Amended) An image indexing method according to any ~~one of Claims 2 to~~ Claim 4, wherein each of the data items of the first type, representing at

least one characteristic of the visual content of a block under consideration of the image, represents the distribution of colours in the block.

10. to 12. (Cancelled)

13. (Currently Amended) An image search A method according to
Claim 11, of searching for images, from an example image, in a database in which digital
images are stored, wherein the example image and each of the images stored in the
database are indexed according to an image indexing method,
wherein said image indexing method comprises the following steps
generating a first information item characteristic of the visual content of the
image;
generating a second information item from the first information item,
wherein the second information item is indicative of a degree of significance of the visual
content of at least one of the plurality of blocks with respect to the overall content of the
image and thereby characteristic of the spatial distribution of the visual content of the
image in its image plane; and
associating, with the image, an index composed of the first information item
and the second information item,
and wherein the image search method comprises the following steps
calculating a first similarity between the example image and each of the
images amongst a predefined plurality of stored images, the first similarity being calculated

from the second information items associated respectively with the example image and the stored image under consideration;

providing a first subset of images selected from amongst the predefined plurality of images according to their degree of first similarity with the example image;

calculating a second similarity between the example image and each of the images amongst the first subset of selected images, the second similarity being calculated from the first information items associated respectively with the example image and the selected image under consideration; and

providing at least one image referred to as a result image, the at least one result image being selected from amongst the first subset of selected images, according to its degree of second similarity with the example image,

and wherein said step of calculating a first similarity between the example image and each of the images amongst a predefined plurality of stored images is implemented by an isomorphism detection method applied to quadtrees representing the second information items associated respectively with the example image and the stored image under consideration.

14. (Currently Amended) An image search method according to ~~any one of Claims 11 to 13~~, wherein said step of calculating a second similarity between the example image and each of the images amongst the first subset of selected images is implemented by calculating a distance between the first information item associated with the example image and the first information item associated with the stored image under consideration.

15. (Previously Presented) An image search method according to Claim 14, wherein said step of calculating the second similarity is implemented by calculating the sum of the distances between each of the components of the first information item associated with the example image and the corresponding component of the first information item associated with the stored image under consideration.

16. (Previously Presented) An image search method according to Claim 15, wherein each of the components of the first information items associated with the example image and with the stored image under consideration is a colour histogram and the sum of the distances between these components is the sum of the intersections between these components.

17. (Currently Amended) A digital data processing device, comprising means adapted to implement an image indexing method according to any one of Claims 1 to 4[, 7] and 8.

18. (Currently Amended) A digital data processing device, comprising means adapted to implement an image search method according to ~~any one of~~ Claims 10 to 13.

19. (Cancelled)

20. (Previously Presented) A computer, comprising a digital data processing device according to Claim 17.

21. (Currently Amended) A computer program stored on a computer-readable medium, the program comprising program instructions for causing a computer to perform an image indexing method according to any one of Claims ~~1 to 4~~[[, 7]] and 8.

22. (Currently Amended) A computer readable medium having thereon a computer program comprising computer executable instructions for causing a computer to perform an image indexing method according to any one of Claims ~~1 to 4~~[[, 7]] and 8.

23. (Currently Amended) A computer program stored on a computer-readable medium, the program comprising program instructions for causing a computer to perform an image search method according to ~~any one of~~ Claims ~~10 to 13~~.

24. (Currently Amended) A computer readable medium having thereon a computer program comprising computer executable instructions for causing a computer to perform an image search method according to ~~any one of~~ Claims ~~10 to 13~~.

25. (Cancelled)

26. (Currently Amended) ~~An image indexing A method according to Claim 25, of searching for images, from an example image, in a database in which digital~~

images are stored, wherein the example image and each of the images stored in the database are indexed according to an image indexing method,
wherein said image indexing method comprises the following steps
generating a first information item characteristic of the visual content of the image;
generating a second information item from the first information item,
wherein the second information item is indicative of a degree of significance of the visual content of at least one of the plurality of blocks with respect to the overall content of the image and thereby characteristic of the spatial distribution of the visual content of the image in its image plane; and
associating, with the image, an index composed of the first information item and the second information item,
and wherein the image search method comprises the following steps
calculating a first similarity between the example image and each of the images amongst a predefined plurality of stored images, the first similarity being calculated from the second information items associated respectively with the example image and the stored image under consideration;
providing a first subset of images selected from amongst the predefined plurality of images according to their degree of first similarity with the example image;
calculating a second similarity between the example image and each of the images amongst the first subset of selected images, the second similarity being calculated from the first information items associated respectively with the example image and the selected image under consideration; and

providing at least one image referred to as a result image, the at least one result image being selected from amongst the first subset of selected images, according to its degree of second similarity with the example image,

and wherein said step of calculating a first similarity between the example image and each of the images amongst a predefined plurality of stored images is implemented by calculating a distance between the second information item associated with the example image and the second information item associated with the stored image under consideration,

and wherein said step of generating the second information item comprises the following substeps

calculating, for each of the blocks, a data item of a second type indicative of a degree of significance of the visual content of the block under consideration with respect to the overall content of the image; and

generating the second information item as being a vector having N components, each of which is one of the data items of the second type,

and wherein, for each of the blocks, the data item of a second type, indicative of a degree of significance of the visual content of the block under consideration with respect to the overall content of the image, is obtained by applying the following formula:

$$w_i^{\text{Im}} = \frac{\|h_i^{\text{Im}}\|}{\sum_{i=1}^N \|h_i^{\text{Im}}\|}$$

according to which the data item of the second type is obtained by calculating the ratio between the Euclidean norm of the data item of the first type associated with the block under consideration and the sum of the Euclidean norms of the data items of the first type associated with all the blocks of the image.

27. to 28. (Cancelled)

29. (Previously Presented) A digital image indexing method according to Claim 13, wherein:

the image plane of the image is divided according to a quadtree decomposition process by means of which, at each phase of the decomposition, a block under consideration, referred to as the "parent block", is decomposed into four blocks, referred to as "child blocks", equal in size to a quarter the size of the parent block, and whose combination gives the parent block, the decomposition beginning with the overall image plane of the image and finishing when the predefined number N of blocks is reached;

at each phase of the decomposition, there is calculated, for each of the child blocks, a data item of a second type, indicative of a degree of significance of the visual content of the child block under consideration with respect to the overall visual content of the parent block; and

the second information item is composed of the set of the data items of the second type stored according to a quadtree structure, each node of which is constituted by one of the data items of the second type.

30. (Previously Presented) An image indexing method according to Claim 29, wherein:

at each phase of the quadtree decomposition of the image, there is extracted, from the parent block under consideration, a data item of the first type representing at least one characteristic of its visual content and, for each child block obtained by decomposition of the parent block, there is extracted a data item of the first type representing at least one characteristic of the visual content of the child block under consideration;

the data item of the second type indicative of a degree of significance of the visual content of a child block under consideration with respect to the overall visual content of the corresponding parent block is obtained by applying the following formula:

$$w_i^p = \frac{\|h_f^p\|}{\|h_p\|}$$

according to which the data item of the second type calculated for a child block under consideration is obtained by calculating the ratio between the Euclidean norm of the data item of the first type extracted for the said child block under consideration and the Euclidean norm of the data item of the first type extracted from the corresponding parent block.

31. (Previously Presented) A computer, comprising a digital data processing device according to Claim 18.